CLAIMS

1. A method of forming a gel and/or powder of a metallic oxide, metalloid oxide and/or a mixed oxide or resin thereof from one or more respective organometallic liquid precursor(s) and/or organometalloid liquid precursor(s) by oxidatively treating said liquid in a non-thermal equilibrium plasma discharge and/or an ionized gas stream resulting therefrom and collecting the resulting product.

2. A method in accordance with claim 1 wherein the liquid precursor is transported through an atmospheric plasma discharge and/or an ionized gas stream resulting therefrom, by being dropped under gravity or entrained in a carrier gas.

3. A method in accordance with claim 1 wherein the liquid precursor is treated with a non-thermal equilibrium plasma discharge and/or an ionized gas stream resulting therefrom, in a container.

4. A method in accordance with any preceding claim wherein the liquid precursor is introduced into the non-thermal equilibrium plasma in the form of an atomized liquid.

5. A method in accordance with claim 4 wherein the atomized liquid is introduced into the non-thermal equilibrium plasma by direct injection.

6. A method in accordance with any preceding claim wherein the non-thermal equilibrium plasma is an atmospheric plasma glow discharge.

7. A method in accordance with any of claims 1 to 5 wherein the non-thermal equilibrium plasma is a continuous low pressure glow discharge plasma, low pressure pulse plasma or dielectric barrier discharge.

8. A method in accordance with any preceding claim wherein the liquid precursor is an organometallic compound of titanium, zirconium, iron, aluminium, indium and tin or mixtures containing one or more thereof.

9. A method in accordance with any preceding claim wherein the liquid precursor is an organometalloid compound of germanium or silicon.

10. A method in accordance with claim 9 wherein the silicon organometalloid compound is an organopolysiloxane having a viscosity of from 0.65 to 1000 mPa.s.

11. A metallic oxide, metalloid oxide, mixed oxide and/or an organometallic and/or organometalloid resin thereof obtainable in accordance with the method in any preceding claim.

12. A metallic oxide, metalloid oxide, mixed oxide and/or an organometallic and/or organometalloid resin thereof in accordance with claim 11 wherein the particle size is from 10nm to 250μm.

13. An organometalloid resin in the form of an organosilicone resin in accordance with claim 11 or 12 having the following empirical formula:-

$$(R'''_3SiO_{1/2})_w(R'''_2SiO_{2/2})_x(R'''SiO_{3/2})_p(SiO_{4/2})_z$$

where each R''' is independently an alkyl, alkenyl, aryl, H, OH, and wherein $w + x + p + z = 1$ and $w < 0.9$, $x < 0.9$, $p + z > 0.1$.

14. An apparatus for making powders by the method of claims 1 to 10 comprising a means for generating a non-thermal equilibrium plasma, a means of introducing and/or retaining liquid precursor, characterised in that the means of introducing the liquid precursor is an atomiser.

15. An apparatus in accordance with claim 14 wherein said apparatus is an atmospheric pressure glow discharge assembly wherein the atmospheric plasma is generated between spaced apart parallel electrodes which are either flat, parallel or concentric parallel electrodes.

16. An assembly in accordance with claim 14 comprising a pair of vertically arrayed, parallel spaced-apart planar electrodes with at least one dielectric plate between said pair of electrodes, adjacent one electrode, the spacing between the dielectric plate and the other dielectric plate or electrode forming a plasma region.

17. An assembly in accordance with claim 16 wherein each electrode is in the form of a watertight box having a side formed by a dielectric plate having bonded thereto on the interior of the box a planar electrode together with a liquid inlet adapted to spray water or an aqueous solution onto the face of the planar electrode.

18. Use of a metallic oxide, metalloid oxide, mixed oxide and/or an organometallic and/or organometalloid resin thereof in accordance with claim 10 in optoelectronics, photonics, flexible electronics, optical devices, transparent electrically conductive films, displays and solar cells or as thermally conductive fillers.

19. A method in accordance with claim 9 wherein the silicon organometalloid compound is an organopolysiloxane having a viscosity of from 100 mPa.s to 1,000,000 mPa.s. dissolved in an organic and/or organosilicone solvent.